Online Forum Discussion: Making Sense of How Knowledge is Woven in a Tapestry of Social Interactions and Collaboration

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Abstract

This paper describes how students in a wholly online master course interacted and collaborated in constructing knowledge through forum discussions. This examination of roles and behaviours of forum participants is an attempt by the author, who was the facilitator, to understand how her students engaged in constructing knowledge, rather than to test existing theories on online discussions. For each thread in the forum, an overall analysis of its life, captivity, magnitude and period of interaction was first analysed. Two discussion threads with the highest value for life of thread, captivity and magnitude were then examined in detail. A visual representation of the network of communication among participants was created to reveal the strength of relationships and structure of social network. Then, in trying to get a richer snapshot of the postings, three different analysis tools namely, Johnson and Johnson's categories of behaviours in collaborative learning situations, Fahy's Transcript Analysis Tool as well as Gunawardena, Lowe and Anderson's constructivist knowledge creation phases, were used. An interesting finding is that even with minimal facilitator intervention in the forum, discovery and exploration of dissonance occurred and this had led to the negotiation of meaning, testing and modification of proposed synthesis of knowledge, and finally, application of newly constructed knowledge. Other findings from the analyses of the two threads include (1) there was much collaborative behaviour among participants in terms of contributing to discussions and seeking input, (2) there were several instances where participants were observed to connect what they had discussed in other threads by referring to those postings, and (3) several participants displayed reflective thinking in revealing their beliefs, doubts, and their reasoning.

Role and Characteristics of Online Forum Discussions

Asynchronous technology is widely used in distance learning courses (Wu & Hiltz, 2004). One such application of asynchronous technology is the electronic discussion group also known as online forum discussion board. Course developers generally incorporate online forum discussions with the hope of supporting students' learning and supplementing course input. Literature indicates that the use of online technologies offer opportunities for constructing and negotiating meaning as well as for promoting critical thinking processes.

The notion of a learning community free from spatial and temporal constraints appeals to designers, developers, and practitioners of online learning. However, the extent to which online facilitators and learners draw benefit from it is very much dependent several factors. First and foremost on the part of the facilitator, it is not a matter of uploading any topic and saying "come discuss"; the nature of the topic to be discussed plays an important part in opening up avenues for interaction, as is the role of facilitators in moderating learners' contributions. There is also the willingness of the participants in putting forth their ideas or opinions or responding to other participants' posting and the prior knowledge, experience and online competency they possess to be considered.

Unlike traditional face-to-face discussions, online discussions operate under different assumptions and possess distinctly different dynamics (MacKinnon, 2000). In online discussions, we assume (correctly or incorrectly) that all participants are "in the picture", reading all the posts and are following the point of discussion. We would also like to think that before coming to the discussion

board, participants have done their "homework" of reading up course readings so that they at least have some basic knowledge of what is being discussed. Then, as compared to traditional class discussions, online discussions have the advantage of "expansion of time" (Meyer, 2003). The lack of immediacy of responses changes the whole learning scenario as learners (and facilitators as well) now have more time to re-examine thoughts and facts as well as word postings more carefully and at a greater length or succinctly as desired. Besides that, facilitators are not really in control of getting non-participating learners to come into the discussion, even with the lure of marks for participation.

Analysis Tools for Online Forum Discussions

Content analysis of online forum discussions can be rather tedious and time-consuming, yet not fully revealing the full essence of what transpired among participants. Much of the learning process that takes place may only be interpreted based on what is visible online, not much more. Therein lies the difficulty of understanding the context of the "talk" and true intention of participants. Clarification of statements can only occur if one asks for it; otherwise any misinterpretation or misperception would remain and go unnoticed.

While there appears to be several tools available for analyzing postings to forum discussions, the question of which to use depends very much on what the researcher is looking for and usually only one is chosen at any one time. According to Thomson, Reeves-Lipscombe, Stuckey and Mentis (2007), the selection of an appropriate tool was difficult in that different tools suit different interactive environments, a matter of "different horses for different discourses" (p. 1). Further, the perennial issue of reliability and validity of currently available tools as well as the suitable unit of analysis abound in literature, making it even more difficult to select one that can accurately analyse discourse reliably.

Spatariu, Hartley and Bendixen (2004) in Corich, Kinshuk and Hunt (2004) reported that studies on participation in discussion forums generally fall under one of the following categories: levels of disagreement, argument structure, interaction-based and content analysis; the most commonly used being content analysis. In discussing content analysis of computer conference transcripts, Rourke, Anderson, Garrison and Archer (2001) examined 19 computer mediated communication content analysis studies and found that the unit of analysis ranged from sentence, to paragraph, message and thematic.

Major contributions to the research into online forum discussions include the following:

(a) Henri (1992) used the thematic approach to analysis identified following five dimensions which can be used to evaluate CMC namely participative, social, interactive, cognitive and metacognitive. The cognitive and metacognitive dimensions measured reasoning, critical thought and self-awareness.

(b) Newman, Webb and Cochrane (1995) utilized a thematic approach for the analysis of critical thinking and based on this, Hara, Bonk and Angeli (2000) came up with the analysis of paragraphs according to elementary clarification, in-depth clarification, inferencing, judgement and application of critical thinking strategies.

(c) Gunawardena, Lowe and Anderson (1997) created an interaction analysis model that examined constructivist knowledge creation phases.

(d) Zhu (1997) used a thematic approach to examine interaction, participation, participant roles and knowledge construction. This led to the development of the Transcript Analysis Tool by Fahy (2001) which categorized sentences according to questions, statements, reflections and coaching and scaffolding.

(e) Garrison, Anderson and Archer (2000) developed a "community of learning" model which assumes that learning occurs through the interaction of three core components: cognitive presence, teaching presence, and social presence.

Knowledge Construction, Social Interaction & Collaboration

As in face-to-face learning communities, a group consisting of the facilitator and the learners may be viewed as the engine of knowledge construction and the interactions that occur within the group as the power source that generates meaning to the whole act of learning. Woods and Ebersole (2003) asserts that the "distance" in distance education involves more than geographical separation, it also incorporates social and pedagogical distance. This makes effective dialogue more difficult though not unachievable, as compared to face-to-face teaching and learning situations.

Constructivist learning theories emphasize the social nature of learning. In online discussion forums, communal scaffolds that are collaborative in nature and stresses interdependence, extends learning opportunities, facilitates knowledge construction (Woods & Ebersole, 2003). Jonassen and McAleese (1993) were of the opinion that knowledge construction occurs when learners interpret their perceptual experiences in terms of their prior knowledge, current mental structures and existing beliefs. In the interaction analysis framework for computer conferencing developed by Gunawardena et al. (1997), five phases of the knowledge construction process are outlined namely (1) sharing and comparing of information, (2) discovery and exploration of cognitive dissonance, (3) negotiation of meaning also known as co-construction of knowledge, (4) testing and modification of propose co-construction, and (5) applications of newly constructed meaning. According to them, active knowledge construction progresses through the five phases, although that might not occur all the time.

So how and when does knowledge actually get "constructed"? The process of knowledge construction comes about only when there are productive and meaningful interactions among the participants; it does not happen when learners just goes online to discuss trivial matters or when they just quote course readings to add to postings. In attempting to analyse the type of online support given by participants in online discussions, Fahy (2001) categorized interaction into five categories, that is, (1) questions, (2) statements, (3) reflections, (4) scaffolding and engaging.

According to Johnson and Johnson (1996), collaboration in online discussions enables scaffolding of thinking to occur. The behaviors that characterize positive social interdependence include (1) contributing (giving and receiving help, exchanging resources and information), (2) seeking input (giving and receiving feedback, challenging and encouraging each other), and (4) jointly reflecting on progress and process. It could be said that it takes the effort and time of all involved for the group to be able to build an environment conducive to the attainment of higher order thinking. Each and every participant need to be ready to share information and resources, willing to reveal one's inadequacies as much as giving help to others as well as assume responsibility to get the discussion going. According to Curtis and Lawson (2001), when learners articulate and share their understandings, there is potential for sharing the cognitive load of the learning task, for greater on-task engagement and for greater mutual explanations.

Objective of study

The objective of this study was:

1. To examine the online interactions and collaborative behaviour among the students in the process of knowledge construction in a wholly online master course

Research question

The research question that guided this study was:

1. How did the students of a wholly online master course interact and collaborate online in the process of constructing knowledge?

Limitations of the study

This examination of roles and behaviours of forum participants is an attempt by the author, who was the facilitator, to understand how her students engaged in constructing knowledge, rather than to test existing theories on online discussions. As such, the validity and reliability of analysis tools used were not addressed and there was no attempt to have a second coder to verify the accuracy of interpretation of the postings in the forum.

In addition, this study analysed the content of observable, text-based discourse which occurred online and any conversations which might have occurred privately via instant message or email, were not included. Finally, participants' perceptions and verifications of the findings which would have provided a bigger and more accurate picture of the discussions that took place were not sought.

Methodology

The Participants

Participants of the discussion forum included the author who had previous experience as an online facilitator for blended courses but was a first time facilitator in a wholly online course, and 18 registered students of a master course in Instructional Design and Technology. The students were from various countries around the world such as Jamaica, the Bahamas, India, Pakistan, Cameroon, the Swaziland, Indonesia and Malaysia. Their age ranged from mid-twenties to mid-fifties. Majority possessed a basic degree and at least three had a post-graduate qualification in other fields. Approximately an equal number of them had previous online teaching-learning experience as those who did not have.

The Context

The course for which the participants were involved in was "Applying Learning Theories to Instructional Design". The forum which was the first of two graded forums for the course ran for a duration of 21 days from 4 February through 25 February 2009. The task for the forum which constituted ten percent of the total marks for the course was as follows:

"Select one example of learning that you see at home, place of work or in public. Describe the learning and the steps involved in the learning. Which theory of learning explains this? Give an example of an instructional media (print, electronic or online) that can be used to support this theory of learning."

Data analysis

Firstly, for all threads in the forum discussion board, an overall analysis of its life, captivity, magnitude and period of interaction was first analysed. The life of a thread is defined as the total number of responses for the thread while captivity refers to the number of participants taking part in the discussion thread per the total number of participants possible. The magnitude of the thread is the total number of responses for the thread per the total number of postings for the discussion forum within the duration of the forum.

Of the eleven discussion threads that were started by the course participants, only two threads were examined in detail. These threads were the first two in the forum discussion board and were chosen for closer examination as they returned the highest values for life of thread, captivity and magnitude and saw a progression from Phase I to V of the knowledge construction.

Then a visual representation of the network of communication among participants was created to reveal the strength of relationships and structure of social network. Thirdly, in trying to get a richer snapshot of the postings, three different analysis tools namely, Johnson and Johnson's categories of behaviours in collaborative learning situations, Fahy's Transcript Analysis Tool as well as the constructivist knowledge creation phases developed by Gunawardena et al. (1997).

While the original categories of collaborative behaviours as developed by Johnson and Johnson (1996) included planning and social interaction, those categories were not used as they were not applicable to the objective of this study. The coding for the other categories used are as depicted in Table 1. Meanwhile, the coding used for the categories of online interactions as suggested by Fahy (2001) is given in Table 2 and the five phases of active construction of knowledge according to Gunawardena et al. (1997) are shown in Table 3.

Findings and Discussion

Overall Forum Analysis

As may be seen in Figure 3, out of a possible number of 19 participants (facilitator and students), only 11 posted contributions that started new threads. The other seven only responded to other peoples' postings and one did not participate at all in this forum. The two threads discussed in this paper are those numbered 1 and 2 and had the longest life (20 posts) compared to the others, though did not constitute the longest periods of interaction. The period of interaction for the Threads 1 and 2 were six and ten days respectively as compared to a range of two to twelve days for other threads.

Results of the analysis shows that despite the task specifically required the students to post an example of learning, describe the steps involved and explain the learning theory associated, eight out of eighteen students or 44.4 percent did not do so. Also, between 11 and 17 February, there were as many as five to seven threads running at the same time. This could have affected the life and captivity of the different threads.

Analysis of Discussion Thread 1

The life of Thread 1 was 20 with a captivity of 0.37 and a magnitude of 0.21. The interaction which lasted six days saw a progression from sharing and comparing of information to discovery and exploration of dissonance, negotiation of meaning, co-construction and finally application of newly constructed knowledge. In essence, the discussion first evolved around the question of whether different learning theories could be applied to different stages in a traditional mathematics classroom.

In the course of the dialogue (as depicted in Figure 2), the initiator who was the facilitator gave feedback thrice of which two included some form of scaffolding, and sought feedback once. Two horizontal questions were also asked. Only two students specifically and overtly sought feedback from the facilitator and this occurred during Phase I which comprised turn 1 through turn 9. Discovery of dissonance occurred about mid-way through the discussion at turn 10 and 11 when in discussing constructivism, a student posted a query as to whether existing knowledge might prevent rather than facilitate knowledge construction and this was further explored when another student asked what would happen if new knowledge contradicted existing knowledge and beliefs. Four different students (including the two who posed the thought-provoking questions) negotiated meaning through a series of help giving response, feedback giving response, supporting one's response as well as overt personal reflections.

At turn 16, a student offered information on available resource to confirm what was agreed upon at that point in time and the last phase of application of new knowledge was observed through reflections from three participants at turns 17 through 19, including one who posted his sole response at this stage and another who referred to another discussion running concurrently in another thread. This indicates that the students who lurk are able to benefit from the discussion although it would not be obvious unless they post their comments.

The visual representation of the social networking that took place (Figure 3) shows that much two-way communication occurred between the initiator of the thread with the other participants. The total number of such posts was 12 out of 20 or 60 percent of all interactions.

Analysis of Discussion Thread 2

Like Thread 1, Thread 2 had a life of 20 and a magnitude of 0.21. However, captivity was 0.32 with a 10-day interaction period. This shows that Thread 2 had fewer participants in the discussion and took a longer time for the completion of the five phases of knowledge construction. Thread 2 started off with a student sharing an example of a mathematics lesson and the discussion also went on to whether in any one lesson, multiple learning theories could be applied.

Similar to Thread 1, 60 percent of the interactions that took place was between the initiator of the thread and the rest of the participants (Figure 4). It would then appear that the initiator plays an important role in holding the discussions together and in moving it forward.

As shown in Figure 5, sharing and comparing of information occurred from turn 0 through turn 6 and discovery of dissonance was at turn 7 followed by exploration of dissonance until turn 12. This is markedly different from Thread 1 in that Phase 1 and 2 of knowledge construction were equally long. Also, for Thread 2 numerous reflections were observed in Phase 1 and what initiated Phase 2 was a participant challenging another participant's comments that "there is a little bit of each theory in every learning". There were instances of explanation, feedback seeking, help giving, sharing of knowledge and referential and non-referential statements as the participants explored inconsistencies among ideas put forth. Then at turn 13, attempted successfully to reconcile what had previously been discussed to the reality of what actually happens in class by asking if it really mattered that only one learning theory be applied at any one time for a learning situation. Through knowledge sharing and an exchange of help seeking and giving, the group then arrived at the testing of proposed synthesis phase (turn 17) when a participant initiated discussion on the application of what had been discussed with an actual teaching situation. Another participant responded by exchanging information and explaining how the class might be conducted and the thread ended with a direct reference to what had been mentioned earlier. Throughout the discussion thread, the facilitator was the lurker and only posted only once in the middle of the thread.

Conclusion

What triggered this examination of roles and behaviours of my students in the online forum discussions was the richness of the discussion that went on, both as the author tried her best to moderate discussions and when in a reversal of roles, the author who was the facilitator, lurked in cyberspace. In concluding this paper, the author would acknowledge that as literature has pointed out, collaboration and interaction are key components in shared knowledge construction. It could be seen that much bridging and triggering occurred in the asynchronous collaboration as noted by Aviv, Erlich, Ravid and Geva (2003), although it was not necessarily by the facilitator. This concurs with what Rowntree (1995) emphasized, that is, "students are liable to learn as much from one another as from course material or from the interjections of a (online) tutor" (p. 206). It certainly holds true that the facilitator is not alone in the task of getting forum participants to construct knowledge; "just as the moderator is learning, so are the learners moderating and weaving" (p. 210). In this case, it could be the composition of the students who were eager to share and learn as well as brought along with them a wealth of prior knowledge and experience, that contributed significantly to the amazing discussions and for that the author congratulates them for a task well done.

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Table 1: *Categories of Collaborative Behaviours (Johnson & Johnson, 1996)*

Category	Code	Description
Contributing	HeG	Help giving: Responding to questions and requests from others
	FBG	Feedback giving: Providing feedback on proposals from others
	RI	Exchanging resources and information to assist other group members
	SK	Sharing knowledge: Sharing existing knowledge and information with others
	Ch	Challenging others: Challenging the contributions of other members and seeking to engage in debate
	Ex	Explaining or elaborating: Supporting one's own position (possibly following a challenge)
Seeking input	HeS	Help seeking: Seeking assistance from others
	FBS	Feedback seeking: Seeking feedback to a position advanced
	Ef	Advocating effort: Urging others to contribute to the group effort
Monitoring	ME	Monitoring group effort: Comments about group's processes and achievements

Table 2: *Categories of Online Interactions (Fahy, 2001)*

Category	Code	Definition
Questions	VQ	Vertical: Assumes a correct answer exists
	HQ	Horizontal: Invites negotiations on plausible answers
Statements	NRS	Non-referential: Makes no reference to others' comments or views
	RS	Referential: Makes direct or indirect reference to others' statements
Reflections	R	Displays trust by revealing usually guarded material (values, beliefs, doubts, reasoning processes, experiences; both what is thought and why)
Scaffolding	S	Encourages, models, provides hints or help, and generally supports others in difficulties, new or unfamiliar experiences or moments of doubt
Quotations & paraphrase	Q	From sources within or outside a conference, Attributions of quoted or paraphrased materials
Citations	C	Attributions of quoted or paraphrased materials

Table 3: *Phases of Knowledge Construction (Gunawardena et al., 1997)*

Phase	Description
I	Sharing and comparing of information
II	Discovery and exploration of dissonance or inconsistency among ideas, or statements advanced by different participants
III	Negotiation of meaning
IV	Testing and modification of proposed synthesis or co-construction
V	Statement or application of newly constructed knowledge

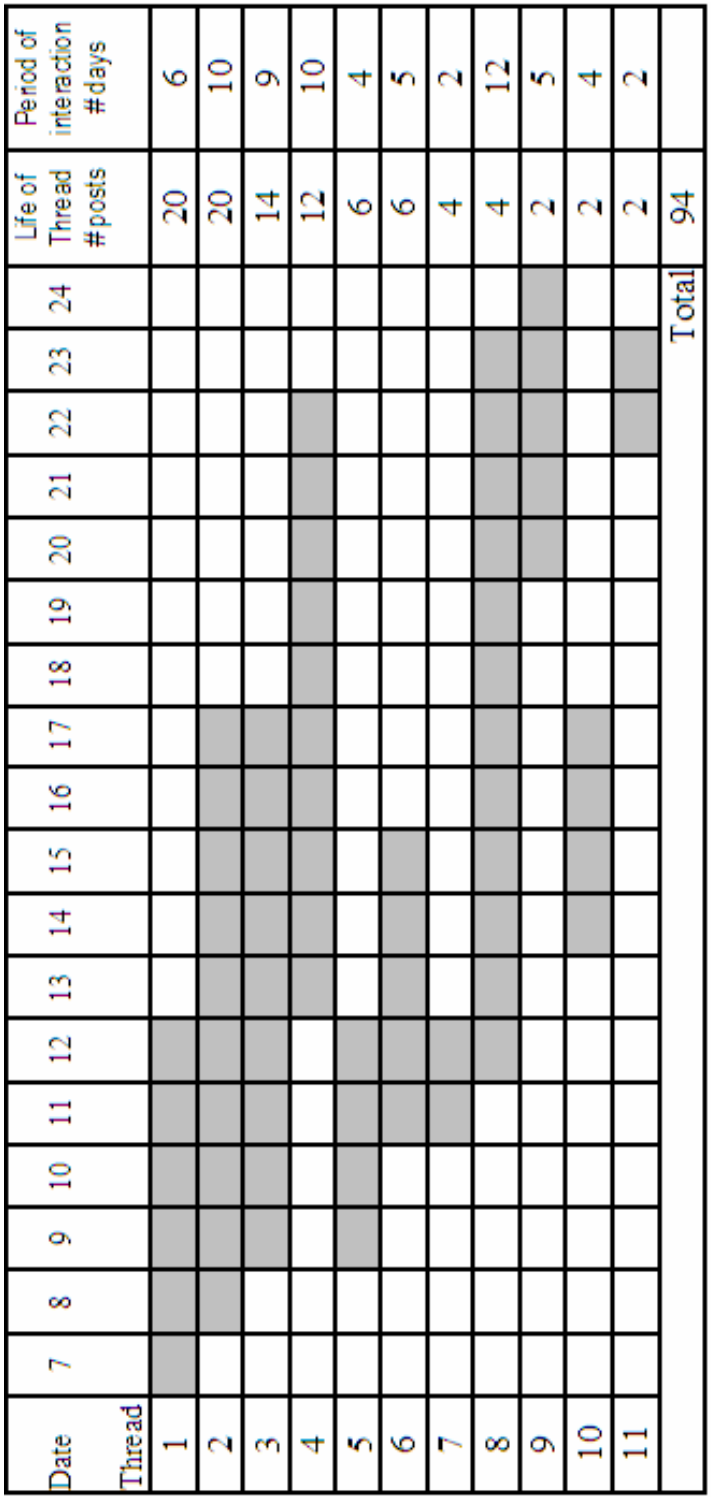

Figure 1: Overall Analysis of the Whole Forum

Turn		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
Knowledge construction phase	I										II		III				IV	V			
T	SK			FBG		FBS		FBG		FBG											4 contributing 2 seeking input
				HQ		HQ		S		S									R		1 questioning 2 scaffolding 1 reflection
Sa		HeG	FBS										FBG				RI				3 contributing 1 seeking input
		NRS	VQ										R								1 statement 1 questioning 1 reflection
Y					HeG						SK					FBG					3 contributing
					NRS						HQ					R					1 statement 1 questioning 1 reflection
K							SK														1 contributing
							VQ		R											R Q	2 reflections 1 quotation
Sh														Ex							1 contributing
												HQ		R							1 questioning 1 reflection
M															HeG						1 contributing
															R						1 reflection
St																					
																		R			1 reflection

Figure 2: Analysis of Discussion Thread 1

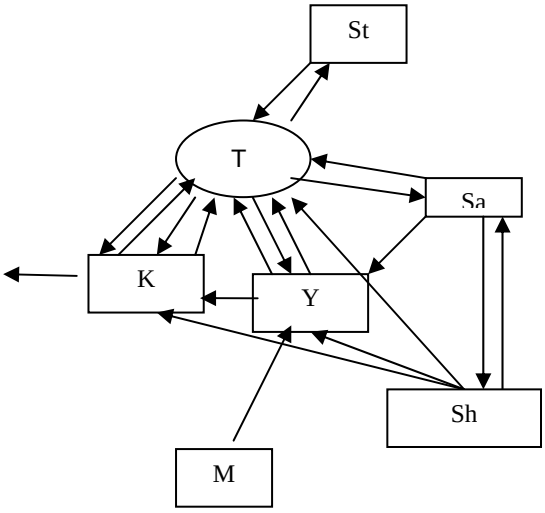

Figure 3: Communication Network of Discussion Thread 1

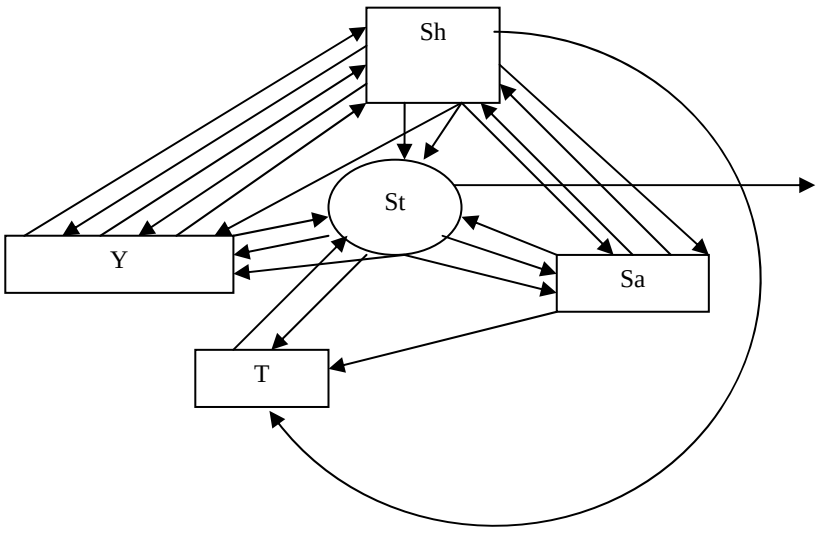

Figure 4: Communication Network of Discussion Thread 2

Turn		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
Knowledge construction phase	I							II						III				IV	V		
St	SK						Ex						Ex								3 contributing
				RS	R		R Q						R								1 statement 4 reflections 1 quotation
Sa		FBG							Ex			SK				HeS					3 contributing 1 seeking input
		R										R									2 reflections
Y			FBG											HeG				HeS		RS	1 statement 2 contributing 1 seeking input
			R											R				VQ			1 questioning 2 reflections
Sh						SK		Ch			HeG				SK		HeG		RI Ex		7 contributing
						RS					NRS				R						2 statements 1 reflection
T										FBS											1 seeking input

Figure 5: Analysis of Discussion Thread 2